BOOK REVIEW.

THE CARNIVOROUS PLANTS. By Francis Ernest Lloyd, Emeritus Professor of Botany, McGill University. (Waltham, Mass., the Chronica Botanica Co., six dollars; Cape Town and Johannesburg, Juta & Co., Ltd.). 1942.

Of all the queer sides of plant life, Carnivorous Plants are surely the most incredible. They claim a place in every botanical course, and the need of a monograph more up to date than Darwin's classic (now nearly seventy years old) has long been felt. So Professor Lloyd's splendid volume is most welcome. It is the result of years of collecting data and carrying out innumerable experiments and observations on the living plants, involving much travel so as to study them in their native habitats. Two visits to this country are pleasant memories here. Of the fifteen genera of flowering carnivorous plants, he has studied all but Genlisea from living material. Had the trap of Genlisea been one of the "active" types, the writer is certain that nothing would have kept him from tracking it down in its unhealthy inaccessible tropical swamps. Fortunately, its lobster-pot trap can be adequately studied from preserved material, as is evident from his beautiful drawing of this remarkably intricate structure.

The chapters incorporating the author's own work on the trap-bladders of Utricularia and the closely-related Pompholyx and Biovularia are a specially valuable section of the book. It was through an observation on the entrance mechanism of one of these traps, fourteen years ago, that he was led to write it. On trying to compare this mechanism with that of other species, he found that precise accounts were lacking, and the exact mode of action of the trap was still a matter of puzzled dispute; not surprising in view of what he has now revealed of its extreme complexity and variety. So he began to investigate these traps for himself, and thus was gradually led up this fascinating botanical byway—a piece of real good luck for other botanists.

In general, these Bladderwort traps are hollow structures, mostly pear-shaped, with an opening closed by two valves. The larger valve (the "door") has several bristly hairs or other form of emergence acting as a tripping mechanism, contact with which knocks the base of the door off its threshold. In the "set" trap, the side walls are pulled inwards owing to their withdrawing much of the water in the trap. Because of their structure and the turgidity of their cells these walls always strive to take an outwardly convex form ; and when the door is knocked open they suddenly expand outwards, with a resultant inrush of water that carries in the prey which has sprung the trap.

This very rough outline of their working does no justice to the complexity of the delicate interlocking structures which make these traps water-tight, or to their curious physiology and their variety. There are many different types—" as if to puzzle you to pick the best "—all so efficient that this is well-nigh impossible. A glance through the beautiful detailed drawings (over a hundred) and micrographs of these traps leaves one marvelling at the " infinite variety " of structure in these tiny objects, and the infinite patience and delicate skill involved in their dissection. It must be remembered that living turgid material is necessary for accurate description, and Professor Lloyd has used this as far as possible in studying the traps of seventy-five species. The writer vividly remembers his exquisite hand-sections and dissections of the microscopic living trap of *Utricularia capensis*—real miracles of manipulation when one compared the relative size of the two organisms !

Though Utricularia has perhaps the most elaborate mechanism, the variety and fantastic ingenuity of the various traps and pitfalls described is amazing. Given the plant material to work with, a committee of engineering experts could hardly have bettered some of them. This applies also, on a microscopic scale, to the varied and ingenious trapping devices of the carnivorous fungi (a very useful chapter collects the scattered information about these oddities). Then too, their biological relations are full of surprises. Take for example the nineteen species of mosquito whose larvae live in the pitcher-water of Nepenthes and nowhere else. In Sarracenia, similar commensal larvae (of mosquito, gnat and fly) have been shown to secrete appropriate anti-enzymes to protect themselves against the pitcher's digestive fluids. Utricularia courts unpopularity with Queensland sugar planters by catching the tadpoles of *Bufo marinus*, which they imported to destroy insects in the cane. Space does not allow quotation of more of this entertaining biological information, but the book is well salted with it.

Carnivorous plants have attracted workers among amateur naturalists as well as professional botanists, and much good work by the former has been modestly hidden away in the journals of local Natural History societies and other publications not always read by botanists, with resultant duplication of effort. For example, the discovery that the bladder of Utricularia is no mere passive trap but an active piece of mechanism was made and published three times between 1911 and 1916, by an entomologist in Switzerland, a botanist in India, and a student in England. Collection and correlation of the scattered data was obviously badly needed, and Professor Lloyd has done valuable service by his careful compilation and discussion of the work of others, to which he does full justice. All interested in these strange plants will be grateful to him for this invaluable guide to their morphology, ecology, physiology and general biological relations.

South Africa has many species of carnivorous plants, including the unique Aldrovanda, the smallest known Utricularia, the largest-leaved Sundew, and of course that classic guinea-pig, *Drosera capensis*. Much still remains to be found out about our species, and one hopes that this book will stimulate workers to fill the gaps in our knowledge. It is so clearly and entertainingly written that anyone with a modicum of botanical knowledge can enjoy it and use it as a guide. Professor Lloyd's drawings and photographs are very clear and helpful, and the 38 plates incorporate hundreds of them. Production is of the high standard we have learnt to expect from Chronica Botanica Altogether, a distinguished performance for which thanks and congratulations are due to both author and publisher.

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